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INSTALLATION GUIDE: ROOF FRAMING

Delivery / Receiving Materials

- 1) The labour requirements of the installer for receiving of materials must be clearly decided by the installer and the job supervisor before scheduling of delivery. This must be decided to match the predetermined specific requirements of the delivery, including but not limited to:
 - a. Site access
 - b. Storage location
 - c. Number of truck loads
 - d. Manual handling of materials; weight and dimensions of each unit.
- 2) The installer must be informed of the amount and type of materials to be delivered.
- 3) The party receiving the materials delivered must check that the type and quantity of materials delivered corresponds to the amount stated on the delivery note. Any inconsistencies must be reported to the job supervisor immediately.
- 4) The materials being delivered must be inspected before offloading. Any defects/scratches observed before, during or immediately after offloading must be reported to the job supervisor immediately.

Material Handling

- 1) Ensure proper PPE is used. Always wear eye protection, steel toe boots, high visibility vests and safety gloves with handling roofing materials.
- 2) Practice proper lifting techniques when handling heavy materials: bending at knees. Use enough manpower for large loads.
- 3) Ensure that members are properly balanced when lifting and that the longer side of the section is lifted vertically. Eg: 2" x 6" purlin should be lifted such that the 6" is vertical.
- 4) When placing materials at their storage location ensure that they are rested and not tossed to avoid bending of the members.



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- 5) If members are to be leaned temporarily while being passed from one level to the next, the member should be placed resting on the shorter dimension of the cross-section.

Material Storage

- 1) Steel rafters must be stored in a covered area and at least 4 inches above grade.
- 2) If the storage area is not available in a covered area, a temporary covering such as tarpaulin should be used to cover the steel. Steel should be primed as soon as possible to reduce the chance of corrosion due to condensation.
- 3) Steel rafters must be painted with one coat of zinc-it or zinc chromate (red/grey/yellow oxide) primer as soon as possible.
- 4) Steel cleats must be stored in a dedicated container not exposed to weather. Cleats must be painted with one coat of zinc-it or zinc chromate (red/grey/yellow oxide) primer as soon as possible. Containers must not be allowed to collect water.
- 5) Bolts, nuts, washers be must be stored in a dedicated container not exposed to weather conditions. These must be separate from any unpainted steel.
- 6) Materials being stored at roof level must be bundled such that the weight of each group is below the acceptable allowable load for the building structure at the point placed. Before storing materials at roof level, always check with the project supervisor for the correct sizing and placement of materials.
- 7) Materials stored at roof level must be secured to prevent movement by wind, or accidental falling.



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Steel Rafter Installation

- 1) Roof layout / design details and dimensions must be provided by the job supervisor.
- 2) Installer must be clear on the size of members and location of each before installation.
- 3) All connection details must be verified before start of installation.
- 4) Connection types:
 - i. Frame to ring beam
 - ii. Frame to load-bearing wall
 - iii. Frame to gable walls (if required)
 - iv. Rafter to rafter
 - v. Rafter to purlin
- 5) Steel members should be primed before erecting.
- 6) Verify the length of each rafter required and mark the location of fixing points and intersections with other beams to ensure that the positions in 3d space match that of the design details.
- 7) Check the building for square-ness and report any obstacles that would require changes to the roof design details.
- 8) When erecting roof beams, always ensure that the design pitch is achieved, as well as the location of the apex, ridge and the designed eave length.
Temporary tack welds are to be minimum of ½" length for every 200lbs of steel being held and are required on all sides of the temporary joint.
- 9) Unless otherwise specified, permanent welds are to be ¼" diameter for the entire length and on all sides of the contact joint.
- 10) Slag is to be removed from the welded joint and the weld visually inspected. A continuous bead should be visible with no holes and evidence of burning or leaking of the metal.
- 11) One coat of primer is required on all completed welded joints.



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- 12) High tensile steel (rebar) does not fuse properly with mild steel (structural steel) when welded and should never be used in framing work, not even for temporary supports.
- 13) Always use control lines at the ridge, eave and centre of rafters/trusses to ensure that start and end points are matched to give a straight finish, and that no members are sagging at mid-span.

Rafters for Light Weight Frame

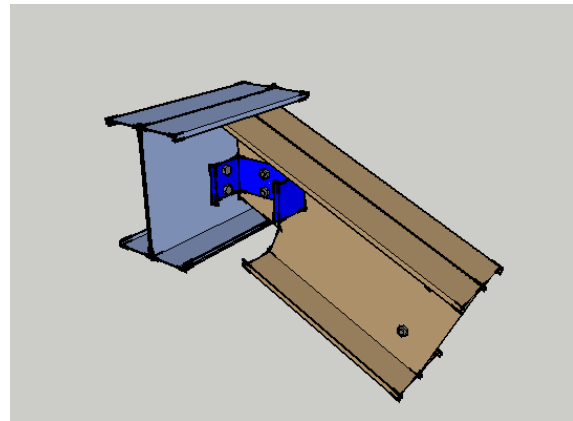
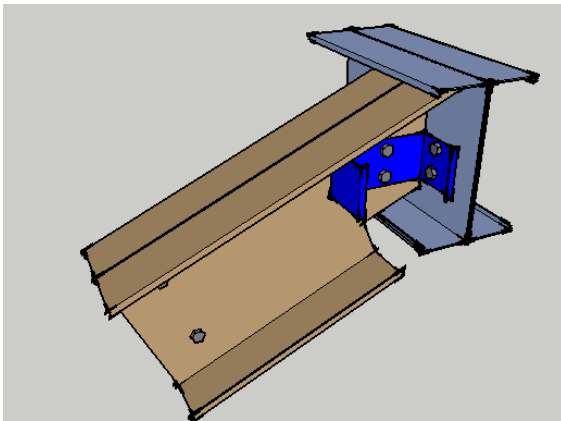
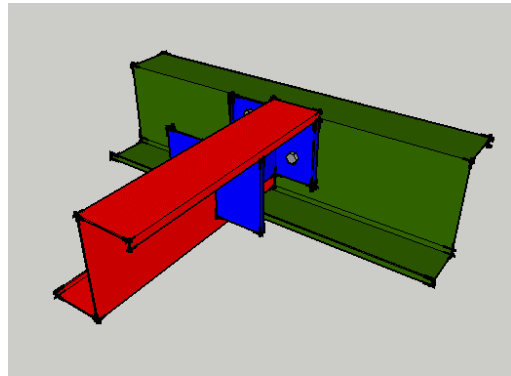
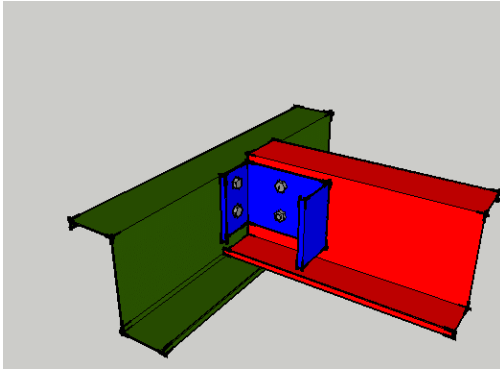
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- 2) Installer must be clear on the size of members and location of each before installation.
- 3) All connection details must be verified before start of installation.
- 4) Connection types:
 - a. Frame to ring beam
 - b. Frame to load-bearing wall
 - c. Frame to gable walls (if required)
 - d. Rafter to rafter
 - e. Rafter to purlin
- 5) In a light weight frame, purlins are used as structural members. Roofing screws must NOT be used as fasteners between structural members and the purlins to which the roof sheets are fastened. – Always verify with your job supervisor the type and size of the bolts & nuts to be used when connecting structural members.
- 6) Welded joints between purlins are not acceptable.
- 7) In the cases where 2 purlins are coupled to act as a single structural member, fasteners should be placed at a minimum of 3ft apart, starting a minimum distance of 2 inches from the end of the member.
- 8) Washers are required on both sides of the bolt and nut assembly. – One between the head of the bolt and the purlin, and one between the nut and the purlin.



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- 9) For intersecting members, bending of the web at joints is not acceptable. Joints can be created using c-purlin sections as shown in the below diagram, **unless specified otherwise.**



- 10) All joint connections are to be fastened by bolt and nuts with washers on both ends.
– Size and type of bolt to be verified by job supervisor.



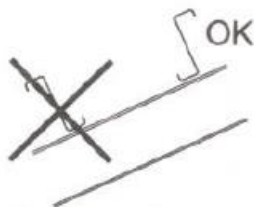
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Purlin Installation

- 1) Ensure that the type and size of purlins specified are delivered to site.
- 2) If various lengths (non-standard sizes) are required, ensure that the proper layout is clear.
- 3) Inspect roof frame with attention to:
 - a. Squareness at eaves, corners and hips
 - b. Levelling at ridge
 - c. Levelling of rafters
 - d. Rafter spacing – spans more than 24 ft may require additional support (may occur at valleys)
 - e. Any other possible defect in roof frame that will not allow installed purlins to achieve levelled finish.
- 4) Verify the purlin spacing (if no cleats installed). Purlin spacing is measured
- 5) Bolt holes in cleats are to be drilled with steel bit. Never burned using cutting torch.
- 6) Verify the connection details for cleats:
 - a. Bolt or welded connection or both
 - b. Type and size of bolts required
 - c. Number and position of bolts – bolt spacing and distance from edge of cleats.
- 7) Washers are always required on both ends of bolt-and-nut assemblies.
- 8) Z-purlins are to be placed with the top flange of the purlin facing up-slope of the roof as depicted below:

Purlin fixing details



- 9) Verify the connection details required between rafter and purlin. The following connection details are to be used unless specified otherwise:

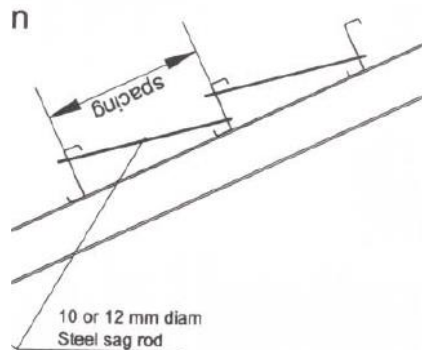


Fixing type 1
(slope $<10^\circ$ & span $<2\text{m}$)



Fixing type 2
(slope $>10^\circ$ and/or span $>2\text{m}$)

- 10) The specified spacing between the purlins is defined by the distance between the webs of neighboring purlins. This is the same as the distance between the same positions along the top flange between neighboring purlins.



- 11) Where no purlin spacing is specified, purlins are to be placed at a **maximum** of 36" (3ft) for 26g sheeting and a maximum of 48" for 24g roof sheeting.

- 12) Ensure that purlins are installed firstly at the eaves and at the ridge of the roof. Purlins in between are to be spaced evenly without exceeding the maximum spacing specified.

- 13) Remember that the shape of the roof is determined by the final placement of the purlins. Always use guidelines to ensure:
- Straightness and levelling of ridge
 - Straightness and levelling at the eaves
 - Squareness and straightness at hips

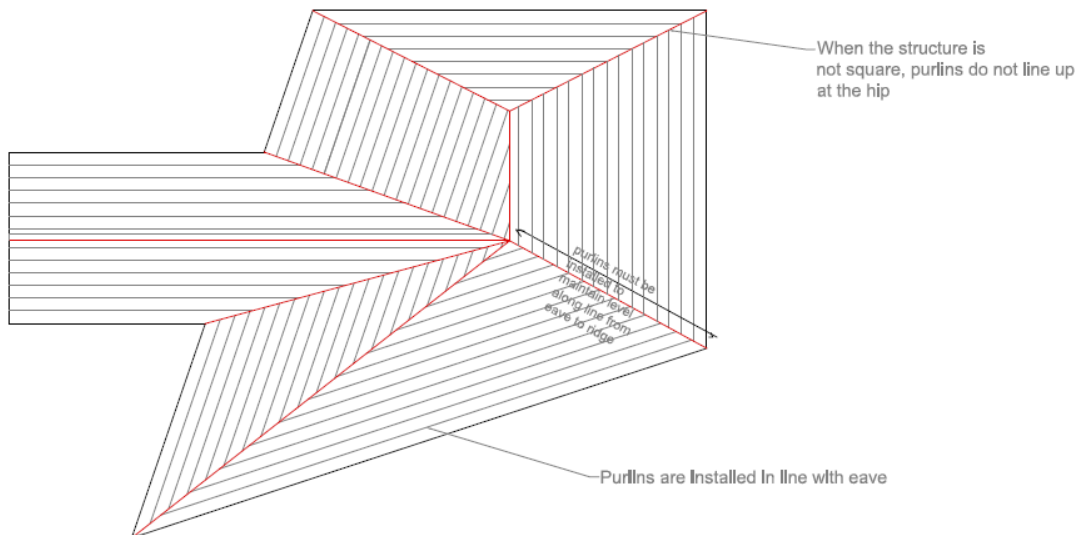


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d. Levelling at purlin junctions at valleys

- 14) The head of valleys at dormers may lie between purlin spacing. Ensure that sufficient support is provided.
- 15) Where overhangs/ eaves are created by purlins only (purlins extend beyond rafters), additional support is required when the purlins exceed 4ft. Unless otherwise specified, this can be achieved by connecting the purlins at the end using 2"x2"x3/8" steel angle, or a C-purlin of similar depth to the purlins being used.
- 16) In cases where the roof design results in hip and valleys in angles other than 45°, purlins will not meet at the same points. In such cases, it must be ensured that:
- Purlins are installed parallel to the eave
 - The correct spacing is maintained
 - Purlins are level along the line from the ridge to the eave.



- 17) It is important that each section of the roof is installed such that the roof sheets will sit to form its own flat section.